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Description of a new species of the genus *Oreonectes* (Teleostei, Cypriniformes, Nemacheilidae) from Guangxi, China

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Abstract

A new loach species, *Oreonectes zhangi* **sp. nov.**, was identified from Xingye County, Yulin City, Guangxi, China. The species can be distinguished from all other congeners by a combination of the following characters: six branched pelvic-fin rays; a reduced posterior chamber of air-bladder; vertebrae 4 + 32; the tip of the male pelvic fin does not reach the anus. Molecular analyses using the Cyt *b* gene showed that the new species forms a monophyletic group and is closely related to *O. damingshanensis*.

Key Words

Morphology, new species, phylogeny, stream fish, taxonomy

Introduction

The genus *Oreonectes* Günther, 1868, comprises a group of loaches predominantly distributed in southern China (Guangxi, Guangdong, and Hong Kong) and northern Vietnam (Zheng 1981; Zhu and Cao 1987; Zhu 1989; Lan et al. 1995; Kottelat 2001). The genus is characterized by several distinctive features, including closely spaced anterior and posterior nostrils, anterior nostrils with a barbel-like elongation that extends beyond the depth of the nostril tube, a flat head that is wider than it is tall, an incomplete lateral line, and a dorsal fin with six or seven branched rays (Du et al. 2023). Historically, the identification of species within the genus *Oreonectes* has been complicated by their morphological similarities, which have often led to misidentifications. For instance, *Oreonectes platycephalus*, the type species of the genus *Oreonectes* described by Günther in 1868, was previously considered to be widespread throughout the Pearl River Basin and Hong Kong. However, recent studies suggest that *O. platycephalus* may represent a complex of multiple cryptic species (Huang et al. 2020; Yu et al. 2023). Ito (2024) redescribed this species and proved the effectiveness of *O. polystigmus* and *O. damingshanensis*.

Advances in molecular biology and phylogenetics have enabled the effective analysis of genetic materials and genetic differences between species, facilitating a clearer understanding of their evolutionary history and taxonomic status. Luo et al. (2023) recently employed multiple genes to elucidate the phylogeny of cave fish within the Nemacheilidae family, resulting in the description of a new genus, *Karstsinnectes*. Currently, the genus *Oreonectes* comprises seven species: *O. andongensis* Luo, Yang, Du & Luo, 2024; *O. damingshanensis* Yu, Luo, Zhou, Deng & Zhou, 2023; *O. guananensis* Yang, Wei, Lan & Yang, 2011b; *O. guilinensis* Huang, Yang, Wu & Zhao, 2020; *O. luochengensis* Yang, Wu, Wei & Yang, 2011a; *O. platycephalus* Günther, 1868; and *O. polystigmus* Du, Chen & Yang, 2008.

In 2023, 15 specimens were collected from a mountain stream in Yulin City, Guangxi, China (Fig. 1). Analysis of these specimens, including both morphological

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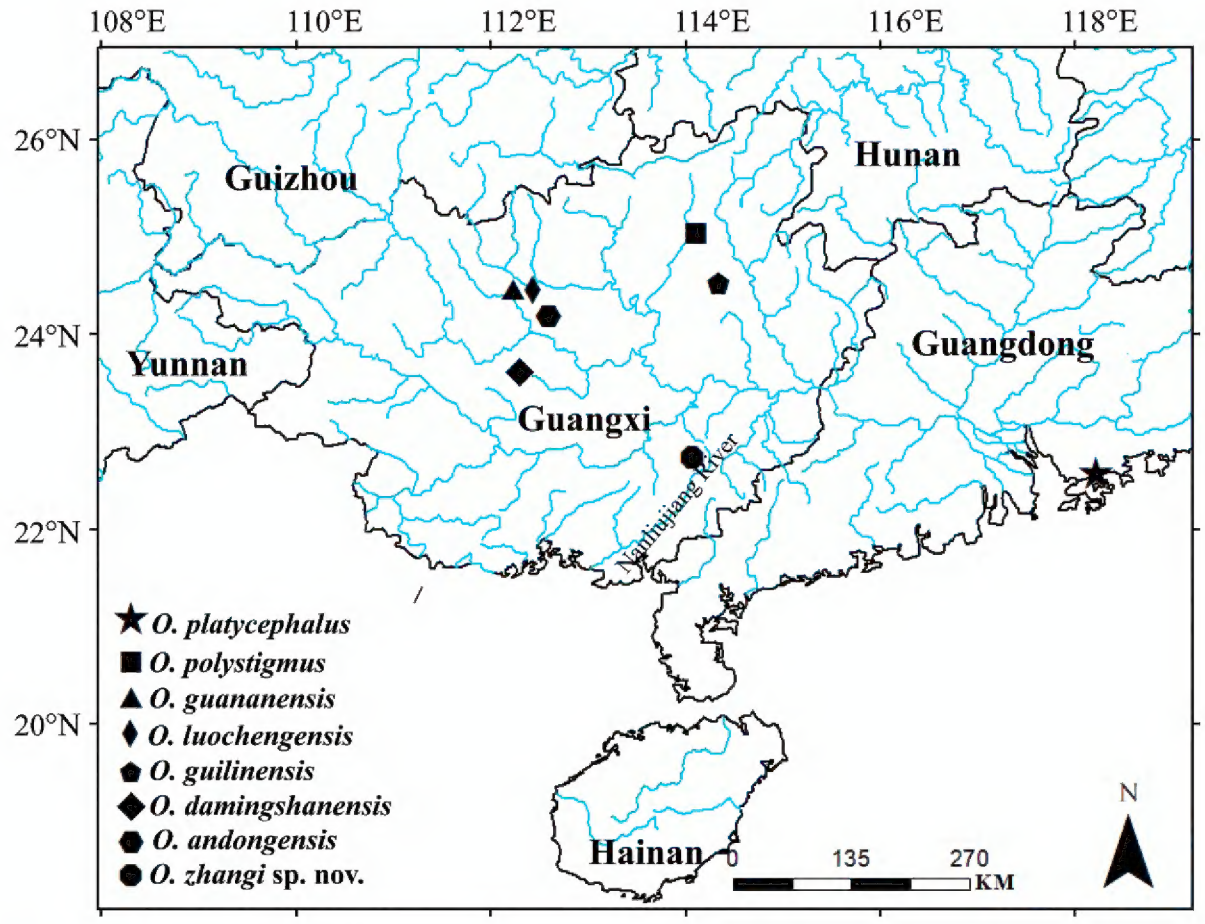

Figure 1. Distributions of *Oreonectes* species.

examination and molecular data from the cytochrome *b* gene (Cyt *b*), revealed significant variations compared to their congeners. Based on these findings, the specimens were identified as a new species within the genus *Oreonectes*, which is described herein.

Materials and methods

Morphological comparisons

In this study, 15 newly collected *Oreonectes* specimens were examined. All measurements and counts follow Kottelat (1990). The specimens were measured point-to-point with a caliper, accurate to 0.1 mm. All measurements were taken on the left side of the specimens. The last two rays of the dorsal and anal fins were counted as one ray, each pair associated with a single pterygiophore. The internal anatomy of the specimens followed the method of Liu and Zheng (2010).

Vertebral counts, including the Weberian apparatus and the last half-centrum, were examined by X-ray images. The caudal skeleton of the new species was studied based on X-ray images, cutting epidermis, and muscle removal. Osteological terminology followed that of Sawada (1982).

Morphological data were analyzed using Microsoft Excel, and statistical analyses were carried out using SPSS v22.0 (SPSS, Inc., Chicago, IL, USA). Principal component analysis (PCA) was utilized to explore morphometric differences between the new species and the similar species. Before analysis, the raw morphometric data were normalized by a logarithmic transformation to minimize the impact of allometry.

Abbreviations used in the study include: **SL**, standard length; **TL**, total length; **HL**, lateral head length; and **NNNU**, Nanning Normal University.

DNA extraction, polymerase chain reaction (PCR), and sequencing

Genomic DNA was extracted from alcohol-preserved pectoral fin tips using a DNA extraction kit from Genenode Biotech (Hubei) Co. Ltd. (China). The mitochondrial Cyt *b* gene was sequenced from three individuals. The forward and reverse primers used were F14724 (5'-GACTTGAAAAACCACCGTTG-3') and R15915 (5'-CTCCGATCTCCGGATTACAAGAC-3'), respectively (Xiao et al. 2001). PCR amplifications were carried out in a 25 μL reaction volume with the following cycling conditions: an initial denaturing step at 95 °C for 5 min, 35 cycles of denaturing at 95 °C for 40 s, annealing at 45 °C for 40 s, and extending at 72 °C for 1 min, followed by a final extension at 72 °C for 10 min. The fragments were sequenced using an ABI Prism 3730 automated DNA sequencer (Applied Biosystems, USA), and the newly obtained sequences were submitted to GenBank.

Phylogenetic analyses

A total of 35 Cyt *b* sequences were used for phylogenetic analysis. In addition to the three new sequences and one *O. damingshanensis* sequence, all the other sequences were obtained from GenBank. *Botia udomritthiruji* Ng 2007 and *Botia lohachata* Chaudhuri 1912 were chosen as outgroups for phylogenetic tree construction. The Cyt *b* sequences were aligned in MEGA v7.0 (Kumar et al. 2016) using the MUSCLE (Edgar 2004) algorithm with default parameters. Both maximum likelihood (ML) and Bayesian inference (BI) methods were used to reconstruct the phylogenetic relationship. ML analysis was run in IQ-TREE 1.6.8 (Nguyen et al. 2015), with the selected F81+F+I+G4 model and 1,000 non-parametric bootstrap replicates. BI was constructed in PhyloSuite v1.2.3. (Xiang et al. 2023), with two independent

runs of 2×10^7 generations and sampling every 1 000 generations. The initial 25% of samples were discarded as burn-in, resulting in a potential scale reduction factor of < 0.01. The best-fit model for BI analyses was determined using the Bayesian information criterion (BIC) in PartitionFinder v2.1.1. (Lanfear et al. 2017), resulting in the selection of the K80 + I + G model. Tree nodes were considered strongly supported with Bayesian posterior probabilities (BPP) ≥ 0.95 and Maximum Likelihood ultrafast bootstrap support (UFB) ≥ 95%. Uncorrected *p*-distances (1 000 replicates) based on the Cyt *b* gene were calculated in MEGA v7.0.

Results

Morphometric analysis

Based on the results of PCA, two principal components of the morphological characters of *Oreonectes zhangi* sp. nov. and *O. damingshanensis* were extracted (Table 1). The first principal component (PC1), which accounted for 67.6% of the variance, was influenced by total length, standard length, prepelvic length, preanus length, lateral head length, and predorsal length; the second principal component (PC2), which accounted for 11.4% of the variance, was influenced by body width at dorsal-fin origin, head depth at nape, and body depth at dorsal-fin origin.

The principal component scatter plot of 30 measurements of *O. damingshanensis* and *O. zhangi* sp. nov. constructed showed that the phenotypic traits of *O. damingshanensis* and *O. zhangi* sp. nov. formed a cluster with fewer overlapping areas (Fig. 2). The samples of the same group are relatively close in the figure, while the samples of different groups are far apart, indicating that the morphological indexes of the same group are similar, while the morphological indexes of different groups have distinct differences. Thus, *Oreonectes zhangi* sp. nov. could be clearly distinguished from *O. damingshanensis* based on morphological characters.

Table 1. Results and percentage of variance explained by principal component analysis.

Morphometric characters	PC1	PC2
Total length	0.22	-0.09
Standard length	0.22	-0.07
Body depth at dorsal-fin origin	0.16	0.31
Body width at dorsal-fin origin	0.12	0.39
Lateral head length	0.21	-0.05
Predorsal length	0.21	-0.13
Dorsal fin length	0.19	-0.22
Dorsal fin base length	0.15	-0.19
Prepelvic length	0.22	-0.08
Pelvic fin length	0.20	-0.01
Pelvic fin base length	0.13	0.29
Preanus length	0.22	-0.05
Preanal length	0.19	-0.20
Anal fin length	0.19	-0.20
Anal fin base length	0.16	-0.14
Prepectoral length	0.19	-0.14
Pectoral fin length	0.20	-0.12
Pectoral fin base length	0.14	0.29
Caudal peduncle length	0.18	-0.18
Caudal peduncle depth	0.18	0.23
Head depth at nape	0.17	0.32
Maximum head width	0.20	0.09
Snout length	0.19	0.04
Outer rostral barber length	0.17	-0.13
Maxillary barber length	0.17	0.04
Inner barber length	0.16	-0.05
Eye diameter	0.08	-0.25
Interorbital width	0.14	0.03
Distance between anterior nostrils	0.19	0.18
Distance between posterior nostril	0.19	0.15
Eigenvalue	20.29	3.42
Contribution ratio (%)	67.6	11.4
Cumulative contribution ratio (%)	67.6	79

Phylogenetic analyses and genetic divergence

BI and ML methods resulted in similar phylogenetic topologies based on the Cyt *b* sequence, consistent with Du et al. (2023). In addition to the outgroups, seven known genera were included in the phylogenetic trees.

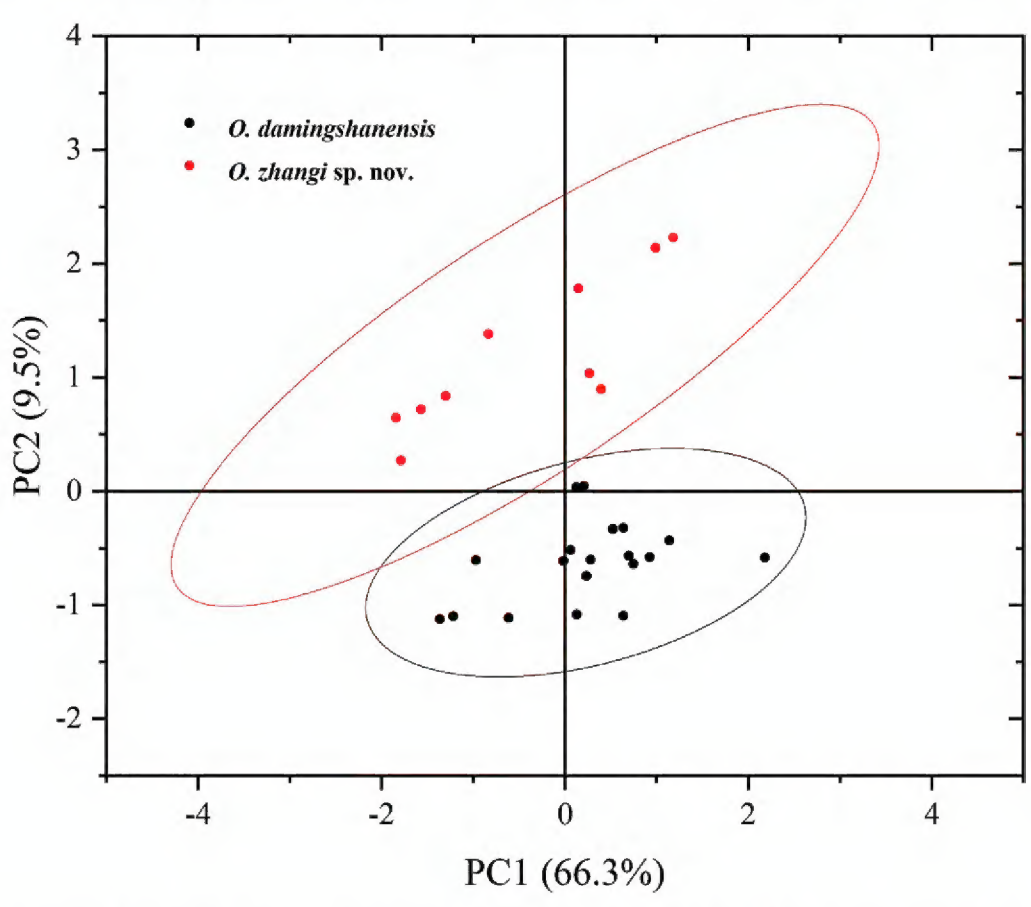

Figure 2. PCA plots of *Oreonectes zhangi* sp. nov. and similar species *O. damingshanensis* based on morphological characters.

The newly collected specimens formed a distinct and well-supported clade with *O. damingshanensis* (BPP = 1; UFB = 95%) (Fig. 3). Uncorrected *p*-distances between the new specimens and other species in *Oreonectes* ranged from 4.6% (for *O. damingshanensis*) to 9.2% (for O. guananensis) (Table 2).

Table 2. Uncorrected *p*-distances (%) between six species of *Oreonectes* based on the mitochondrial Cyt *b* gene.

ID	Species						
1	*Oreonectes zhangi* sp. nov.						
2	*O. andongensis*	7.0%					
3	*O. damingshanensis*	4.6%	6.5%				
4	*O. luochengensis*	7.5%	6.5%	8.0%			
5	*O. guilinensis*	7.4%	7.0%	7.6%	8.2%		
6	*O. guananensis*	9.2%	7.6%	8.9%	5.0%	8.8%	
7	*O. platycephalus*	7.2%	6.7%	7.1%	8.1%	6.7%	8.8%
8	*O. polystigmus*	6.5%	6.0%	6.3%	7.6%	7.5%	8.6%	6.5%

Taxonomic account

***Oreonectes zhangi* Zhong, Yang & Chen, sp. nov.**

https://zoobank.org/73962B24-DB58-41FF-8DBE-0332CAD9635C

Figs 4–10, Tables 3, 4

Materials. ***Holotype.*** • NNNU2023100203 (Fig. 4); 71.1 mm TL, 63.1 mm SL; collected by Jia-Hong Zhong on 2 October 2023; in Mt. Hanshan, Xinye County, Yulin City, Guangxi, China; (22.7364°N, 110.0605°E; elevation 199 m; Fig. 1). ***Paratypes.*** • 14 specimens; NNU2023100201–202, 2023100204–215; were collected by Jia-Hong Zhong from the same locality and at the same time as the holotype.

Etymology. The species was named in honor of the three Zhang brothers, who assisted local residents in locating water during an ancient drought. Following their passing, they were revered as rain deities by the community (Li 2014). We suggest the common Chinese name "张氏岭鳅" (Zhang Shi Ling Qiu).

Comments. *Oreonectes zhangi* sp. nov. is classified within the genus *Oreonectes* based on molecular phylogenetic analyses and genus-specific characteristics, including narrowly separated anterior and posterior nostrils, elongated barbel-like anterior nostrils longer than the depth of the nostril tube (Fig. 5), having an epural in the caudal skeleton (Fig. 7), and a rounded caudal fin with 7 branched dorsal-fin rays. (Du et al. 2023; Ito 2024)

Diagnosis. Comparative data between *Oreonectes zhangi* sp. nov. and all seven known species within the genus *Oreonectes* are provided in Table 3. *Oreonectes zhangi* sp. nov. can be distinguished from *O. guilinensis*, *O. luochengensis*, *O. guananensis*, *O. andongensis*, and *O. polystimus* by the reduced posterior chamber of air-bladder (vs. developed), from *O. platycephalus* by six branched plevic-fin rays (vs. 7), seven branched dorsal-fin rays (vs. 6), from *O. damingshanensis* by six branched pelvic-fin rays (vs. 7), the tip of the male pelvic fin not reaching the anus (vs. exceeding) (Fig. 8), vertebrae 4 + 32 (vs. 4 + 34), head depth at nape (59.6–68.1% HL vs. 46.7–54.6%), body depth at dorsal-fin origin (14.0–16.1% SL vs. 11.1–13.3%).

Description. Morphometric data are given in Tables 3, 4. Body elongated and cylindrical, with insignificant depth decreasing from dorsal-fin origin to caudal-fin base. Head short, head length 18.6–20.2% of standard length, slightly depressed and flattened, width greater than depth (head

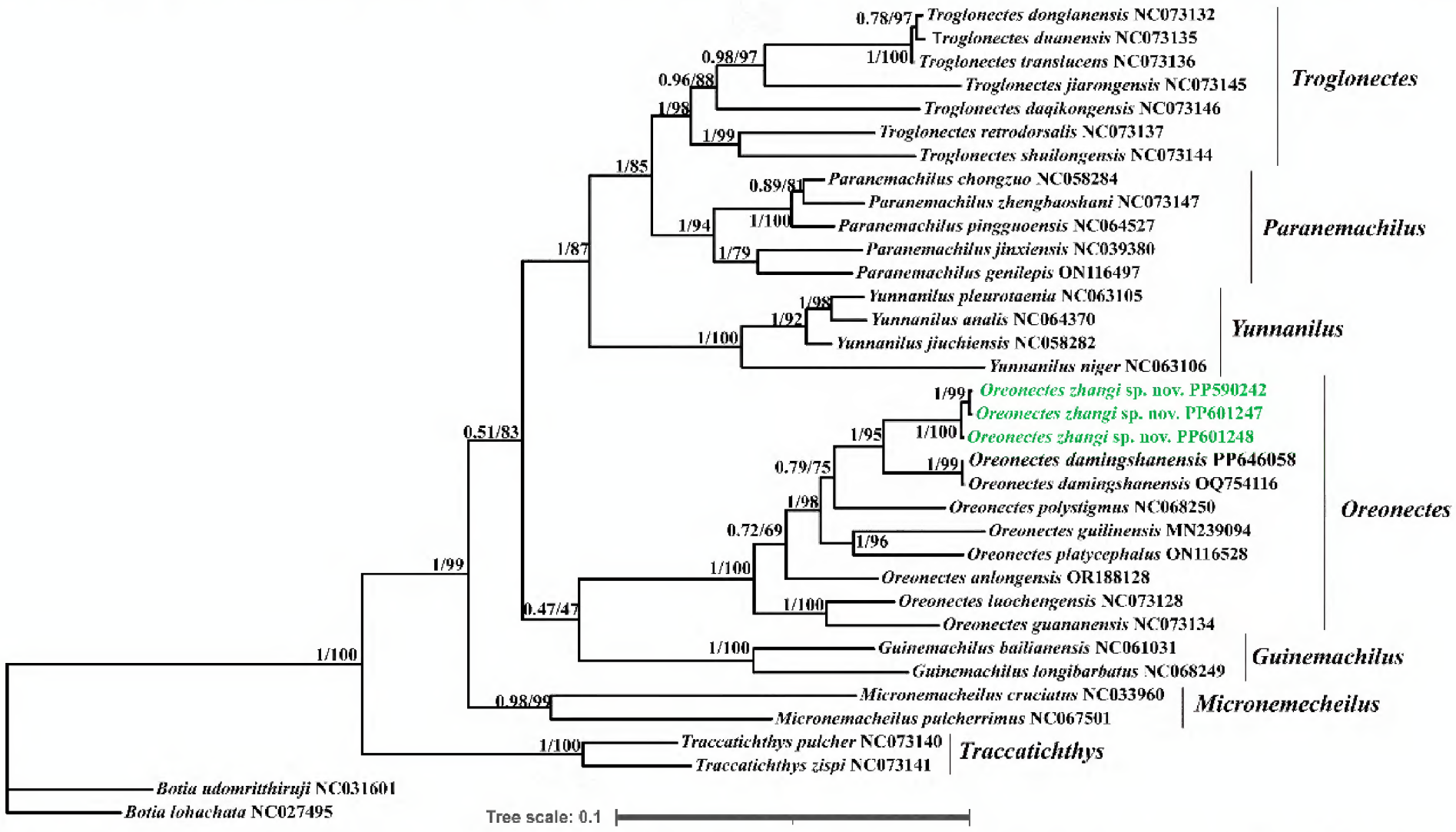

Figure 3. The phylogenetic tree of *Oreonectes* based on the Cyt *b* gene was constructed by Bayesian inference (BI) and maximum likelihood (ML). Node values showed posterior probabilities/bootstrap supports.

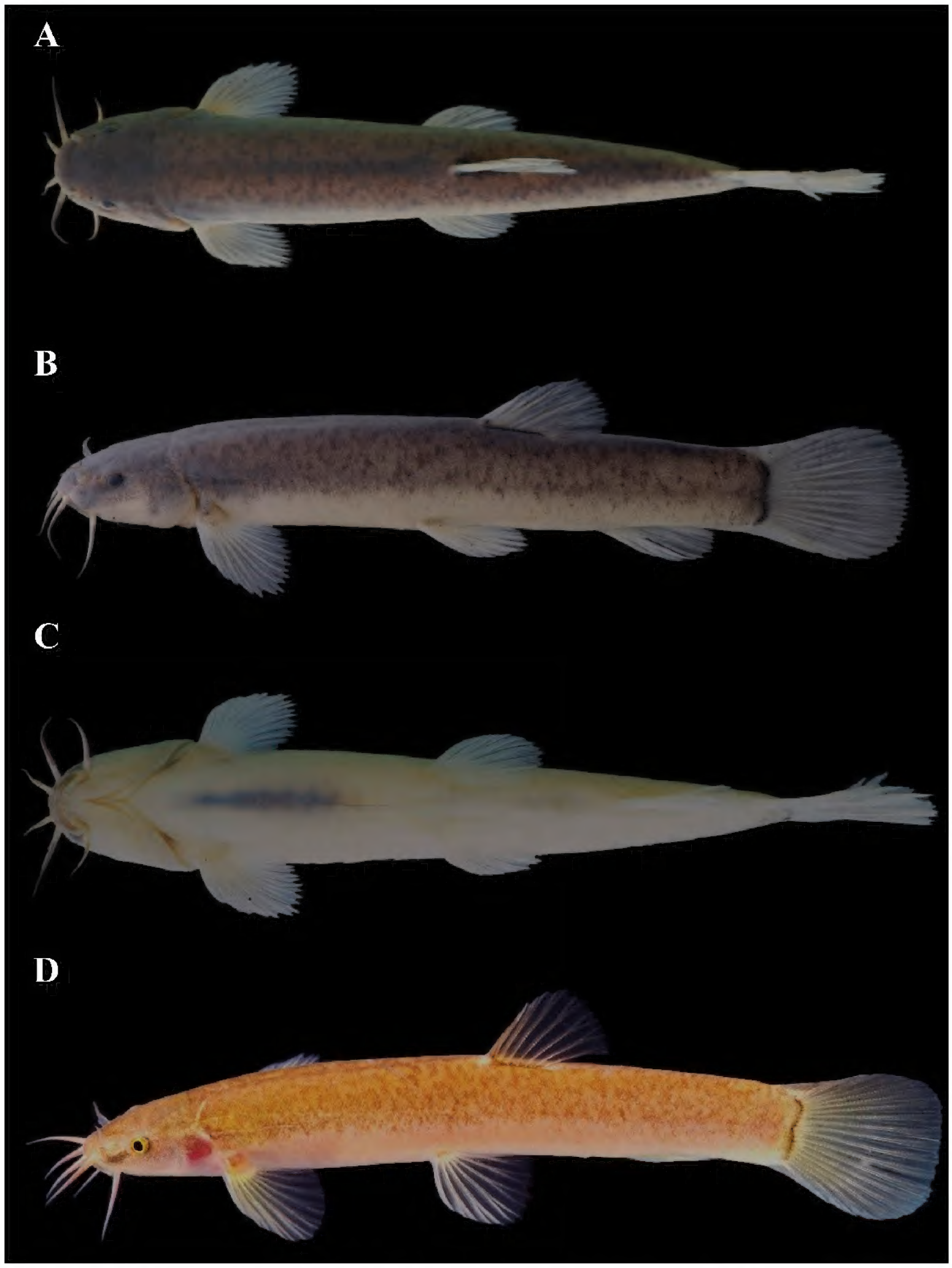

Figure 4. Dorsal, lateral, ventral, and living views of *Oreonectes zhangi* sp. nov. NNNU2023100203, holotype, 71.1 mm TL, 63.1 mm SL.

width/head depth = 1.1–1.5), head depth 59.6–68.1% of head length. Snout round, oblique, and flat, length 38.2–48.8% of head length (HL). Mouth inferior, curved, upper, and lower lips have shallow wrinkles and small spinous processes; lower lip with V-shaped median notch (Fig. 6). Three pairs of barbels, long: inner rostral barbel 35.4–44.1% of HL, extending backward, not reaching anterior margin of eye; outer rostral barbel 49.0–67.6% of HL, extending backward beyond posterior margin of eye. Maxillary barbel 38.4–52.2% of HL, tip not reaching posterior margin of gill cover. Anterior and posterior nostrils are separated by a short distance, 16.8%–36.8% of eye diameter. Anterior nostril tube short, with elongated, short barbel-like tip. Eyes normal, diameter 11.9–17.1% of HL. Gill opening small; gill rakers not developed; nine inner gill rakers on first gill arch (n = 2).

Dorsal-fin rays iii, 7, pectoral-fin rays i, 8–9, pelvic-fin rays i, 6, anal-fin rays iii, 5, branched caudal fin rays 15–16. Dorsal fin short, length 16.7%–21.1% of SL, distal margin round, origin posterior to pelvic-fin insertion, situated slightly posterior to two-thirds distance between snout tip and caudal-fin base. Pectoral fin short, length 15.9%–18.9% of SL. Pelvic fin length 16.1–17.7% of SL; tips of pelvic fin not reaching anus; distance between tips

Figure 5. *Oreonectes zhangi* sp. nov., dorsal view of head., NNNU2023100203, holotype, 63.1 mm SL.

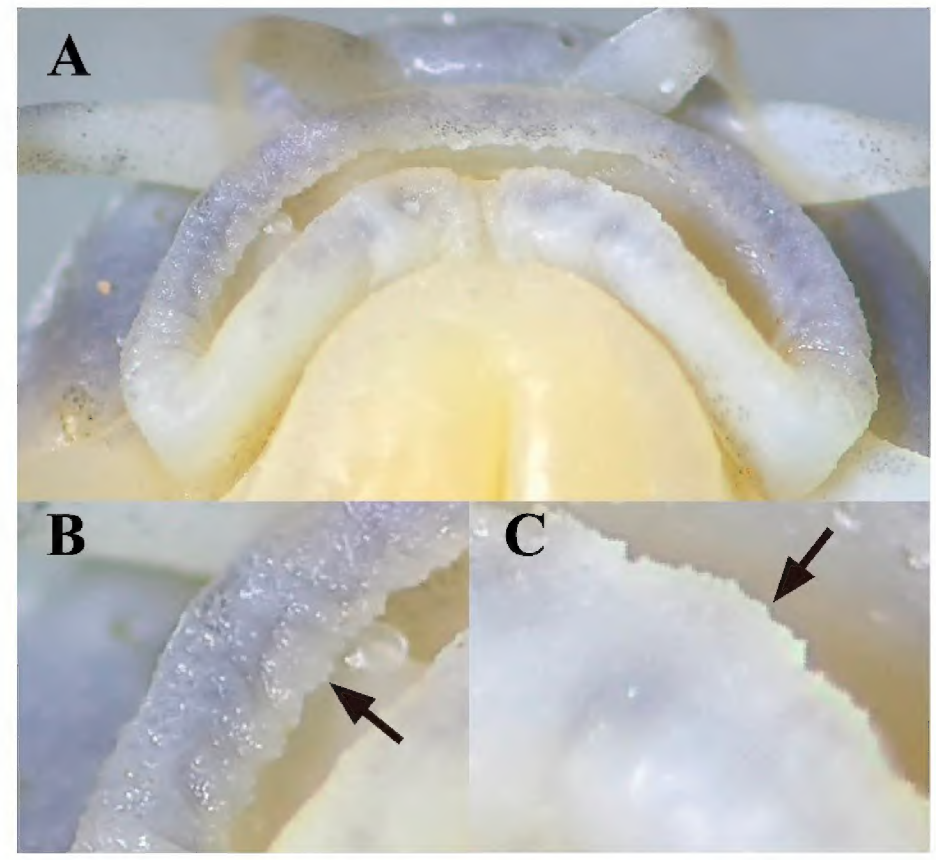

Figure 6. *Oreonectes zhangi* sp. nov., NNNU2023100203, holotype, 71.1 mm TL, 63.1 mm SL. The ventral view of the mouth (**A**) and close-ups of the upper (**B**) and lower (**C**) lips are shown; the black arrow indicates the position of the small spinous processes.

of pelvic fin and anus 0.7 times eye diameter. Anal fin short, length 15.1%–19.5%, origin short distance from anus. Caudal fin rounded, length 13.3%–19.9% of SL, length greater than depth (caudal peduncle length/caudal peduncle depth = 1.1–1.7). vertebrae 4 + 32 (n = 4), having an epural in the caudal skeleton (Fig. 7).

Body completely covered by scales, except head; lateral line incomplete, with 7–13 pores, last one not reaching above tip of pectoral fin; cephalic lateral-line system, with 8 supraorbital pores, 4+9–10 infraorbital pores, three supratemporal canal pores, and 5–8 preoperculo-mandibular canal pores.

U-shaped stomach with straight intestines (Fig. 9). Anterior chamber covered by dumbbell-shaped bony capsule, and posterior chamber reduced, reaching the vertical of the pectoral-fin base (Fig. 10).

Coloration. The body is mainly light yellowish brown in color, with dark brown extending from the front of the eyes to the outer rostral barbel. The base of the caudal fin is black, with each fin showing a light yellow hue. When preserved in 10% formalin, the body color fades to a dark brown shade (Fig. 4B).

Sexual dimorphism. Males have an oval genital papilla located immediately posterior to the anus (Fig. 8B), which is unclear in females (Fig. 4C).

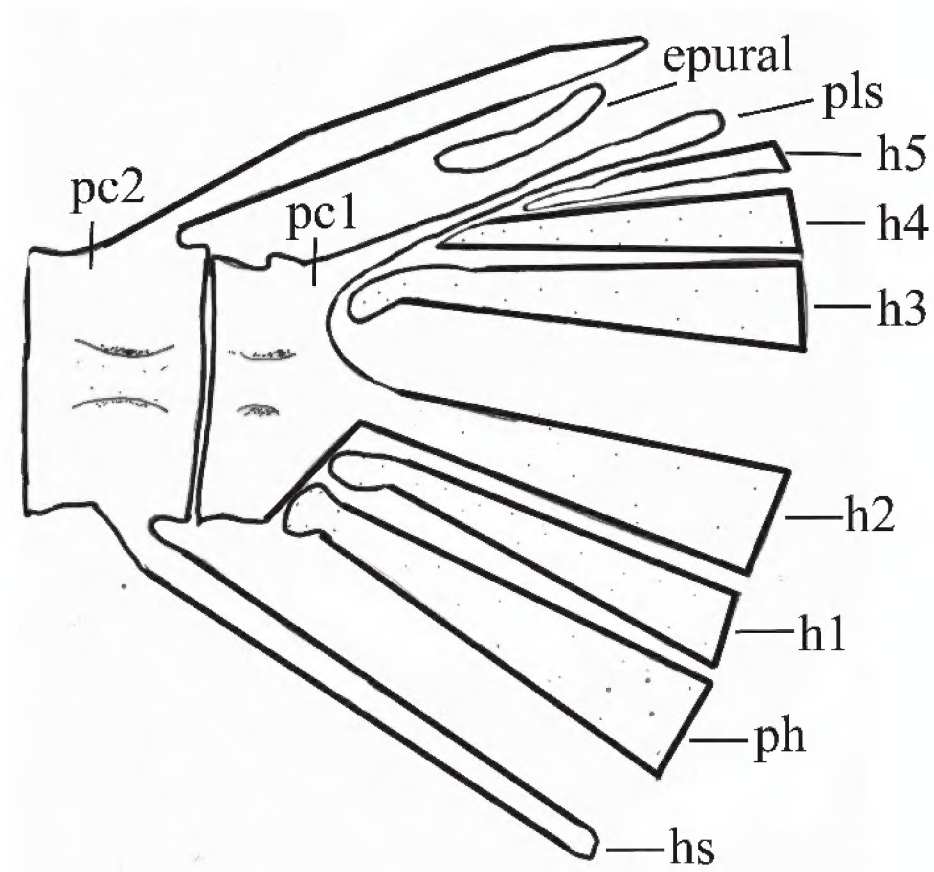

Figure 7. The caudal fin skeleton of *Oreonectes zhangi* sp. nov., NNNU2023100202, paratype, 64.2 mm SL, pc1, first preural centrum; pc2, second preural centrum; h, hypural; hs, haemal spine and arch; ph, parhypural; pls, pleurostylar.

Table 3. *Oreonectes* species and comparison of identifying characteristics between the new species and its congeners.

	Body pigmentation	Dorsal-fin rays	Pectoral-fin rays	Pelvic-fin rays	Anal-fin rays	Caudal-fin rays	Posterior chamber of air-bladder
Oreonectes zhangi sp. nov.	Present	iii, 7	i, 8–9	i, 6	iii, 5	15–16	Reduced
O. damingshanensis	Present	iii, 7	i, 9	i, 7	iii, 5	14–15	Reduced
O. platycephalus	Present	iii, 6	i, 9–11	i, 7	iii, 5	13–15	Reduced
O. guilinensis	Present	ii, 7	i, 10–11	i, 6	iii, 5	13–14	Developed
O. luochengensis	Absent	iii, 7	i, 11–12	i, 7	ii, 5	14–16	Developed
O. guananensis	Present	iii, 7	i, 10–11	i, 7–8	iii, 5	13–17	Developed
O. andongensis	Present	iii, 7	i, 9–10	i, 6	iii, 5	13–14	Developed
O. polystigmus	Present	iii, 6–7	i, 9	i, 6	ii, 5	14–15	Developed

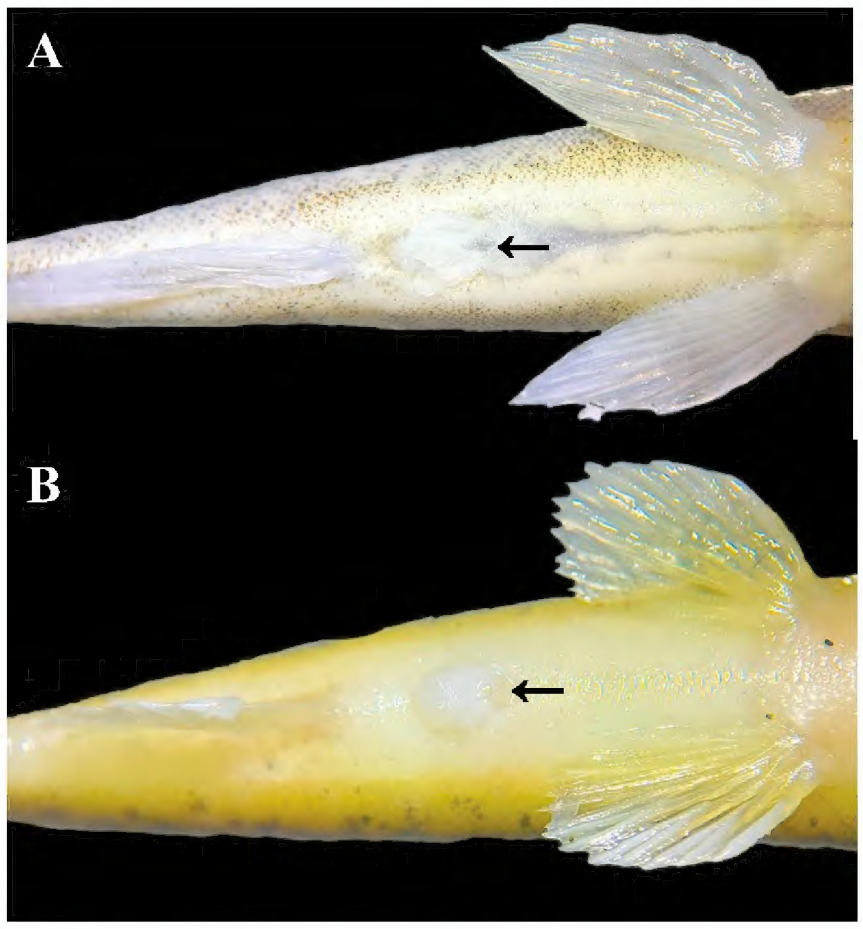

Figure 8. Gonadal structure of *O. damingshanensis* (**A**), NNNU2024052007, 56 mm SL, and *O. zhangi* sp. nov. (**B**), NNNU2023100215, paratype, 43.2 mm SL; the black arrow refers to the position of the anus.

Figure 9. *Oreonectes zhangi* sp. nov., NNNU2023100202, paratype, 64.18 mm SL; digestive tract.

Distribution, habitat, and populations. Based on field investigations, the species is abundant and commonly found in the streams of Mt. Hanshan in Xingye County, Yulin City, and Guangxi, China (Fig. 11). During the day, the species typically seeks shelter in stone crevices and substrates, emerging at night to feed. Exposure to intense light can cause their body color to change from light yellow to dark brown or black. Their diet consists of sediment and tadpoles, including those of Quasipaa spinosa. Interestingly, many pregnant females were collected, even in December. The stream habitats also harbored other species, such as *Schistura fasciolatus*, *Liniparhomaloptera disparis*, and *Rhinogobius similis*.

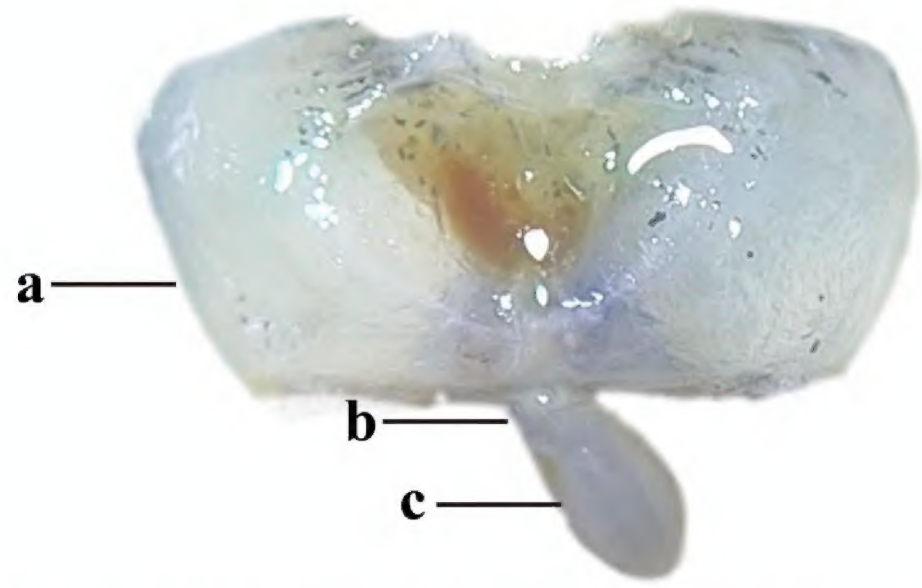

Figure 10. Air-bladder of *Oreonectes zhangi* sp. nov.: a, anterior chamber; b, tube connecting anterior and posterior chambers of the air-bladder; c, posterior chamber.

Discussion

Morphological distinctions between *Oreonectes zhangi* sp. nov. and *O. damingshanensis* included variations in head depth, body depth, number of branched fins, and the shape of genital papillae. Molecular analyses revealed that *Oreonectes zhangi* sp. nov. formed a distinct lineage with *O. damingshanensis*, with an uncorrected *p*-distance of 4.6%. All morphological characters and molecular evidence supported the validity of the new species. *Oreonectes zhangi* sp. nov. is the fourth benthic fish to be identified in surface water systems, similar to *O. damingshanensis*, *O. platycephalus*, and *O. guilinensis*. These fish, inhabiting surface rivers and mountain streams, exhibit sleeker bodies, longer fins and fin bases, and narrower, flatter heads with shorter barbels compared to those species living in underground cave water systems (Yu et al. 2023). Furthermore, except for *O. guilinensis*, the mountain stream-residing species typically possess a reduced air-bladder posterior chamber (Fig. 10, Table 3). Given the shallow water depths usually found in mountain streams, these fish seldom require vertical movement, instead favoring lateral shifts from one location to another (Zhu 1989).

Phylogenetic analysis suggested that the *Oreonectes* group could be divided into two sister groups, with *O. luochengensis* and *O. guananensis* forming one group and *Oreonectes zhangi* sp. nov., *O. polystigmus*, *O. damingshanensis*, *O. guilinensis*, *O. andongensis*, and *O. platycephalus* forming the other.

Comparative material examined

Oreonectes damingshanensis, NNNU2024052001–10, 10 ex, 69.8–85.9 mm, Leping Village, Guling Town, Mashan County, Guangxi, China.

Oreonectes guilinensis, ASIZB208001, holotype, 73.5 mm SL, ASIZB208002–007, paratypes, 6 ex., 52.0–68.3 mm, Shigumen Village, Xingping Town, Yangshuo County, Guilin City, Guangxi.

Table 4. Comparison of measurable traits between *Oreonectes zhangi* sp. nov. and similar species, *O. damingshanensis*. The numbers in parentheses are the mean ± standard deviation (SD).

	***Oreonectes zhangi* sp. nov.**	***O. damingshanensis***
Number of specimens	15	10
TL (mm)	59.8–81.8 (71.0 ± 8.3)	69.8–85.7 (78.9 ± 4.5)
SL (mm)	49.8–67.6 (58.8 ± 7.1)	56–70.6 (65.4 ± 4.6)
Percentage of SL (%)		
Body depth at dorsal-fin origin	14.0–16.1 (14.7 ± 0.7)	11.1–13.3 (12.2 ± 0.7)
Body width at dorsal-fin origin	9.3–12.8 (11.3 ± 1.1)	8.1–10.1 (9.1 ± 0.7)
Lateral head length	18.6–20.2 (19.3 ± 0.7)	18.5–21.2 (19.7 ± 1.1)
Predorsal length	56.2–59.4 (58.0 ± 1.2)	56.8–60.5 (58.3 ±1.1)
Dorsal fin length	16.7–21.1 (17.7 ± 1.4)	16.9–20.7 (18.9 ± 1.3)
Dorsal fin base length	7.2–9.7 (8.7 ± 0.8)	8.2–11.2 (9.5 ± 1.0)
Prepelvic length	48.1–50.8 (49.1 ± 1.0)	48.7–52.6 (50.7 ± 1.1)
Pelvic fin length	16.1–17.7 (16.7 ± 0.7)	14.4–18.3 (15.8 ± 1.2)
Pelvic fin base length	3.9–4.9 (4.3 ± 0.3)	2.8–4.4 (3.5 ± 0.5)
Preanus length	67.4–72.1 (69.3 ± 1.5)	67.0–70.8 (69.2 ± 1.0)
Preanal length	67.7–78.7 (73.8 ± 0.4)	73.8–78.3 (76.0 ± 1.8)
Anal fin length	15.1–19.5 (16.7 ± 1.5)	14.8–20.9 (17.4 ± 1.6)
Anal fin base length	6.6–9.0 (7.4 ± 0.8)	6.9–9.5 (7.8 ± 0.8)
Prepectoral length	18.3–21.2 (19.7 ± 1.1)	17.6–27.7 (21.6 ±2.6)
Pectoral fin length	15.9–18.9 (17.3 ± 0.9)	15.6–19.1 (17.1 ± 1.1)
Pectoral fin base length	4.4–5.3 (4.8 ± 0.3)	3.3–4.6 (3.9 ± 0.4)
Caudal peduncle length	13.3–19.9 (16.1 ± 1.9)	14.3–18.3 (16.3 ± 1.0)
Caudal peduncle depth	11.5–12.5 (11.9 ± 0.3)	9.2–11.8 (10.4 ± 0.8)
Percentage of HL (%)		
Head depth at nape	59.6–68.1 (63.2 ± 2.9)	46.7–54.6 (51.2 ± 2.6)
Maximum head width	70.4–89.3 (82.2 ± 5.3)	71.9–83.2 (76.3 ± 3.7)
Snout length	38.2–48.8 (41.8 ± 3.1)	37.0–44.7 (39.5 ± 2.6)
Outer rostral barber length	49.0–67.6 (57.9 ± 5.2)	50.0–68.2 (56.3 ± 5.6)
Maxillary barber length	38.4–52.2 (46.3 ± 4.7)	37.1–46.4 (41.9 ± 3.6)
Inner barber length	35.4–44.1 (38.8 ± 2.8)	37.1–46.4 (41.9 ± 3.1)
Eye diameter	11.9–17.1 (14.6 ± 1.8)	10.2–17.7 (14.5 ± 2.4)
Interorbital width	29.2–52.5 (44.2 ± 6.7)	39.9–47.5 (43.5 ± 2.2)
Distance between anterior nostrils	25.4–34.4 (31.9 ± 2.8)	25.5–30.6 (28.6 ± 1.8)
Distance between posterior nostril	29.6–41.9 (37.2 ± 3.8)	30.5–34.6 (33.3 ± 1.4)

Figure 11. Habitat of *Oreonectes zhangi* sp. nov.

Oreonectes guananensis, KIZ2010003068–072, paratypes, 5 ex., 51.0–71.9 mm SL, Guan'an Village, Changmei Town, Huanjiang County, Guangxi.

Oreonectes luochengensis, KIZ2010003073, holotype, 71.2 mm SL, NNNU2023080201–2, 2ex, 56.6–70.1 mm, Tianhe Town, Luocheng County, Guangxi, China.

Oreonectes polystigmus, NNNU2024042201–02, 2ex, 47.1–69.8 mm, Dabu Village, Guilin City, Guangxi, China.

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